(4)

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-013282

(43)Date of publication of application : 16.01.1998

(51)Int.Cl. H04B 1/26
H04B 1/16
H04B 7/26

(21)Application number : 09-056173

(22)Date of filing : 11.03.1997

(71)Applicant : PHILIPS ELECTRON NV

(72)Inventor : JANSEN WINIFRIED

(30)Priority

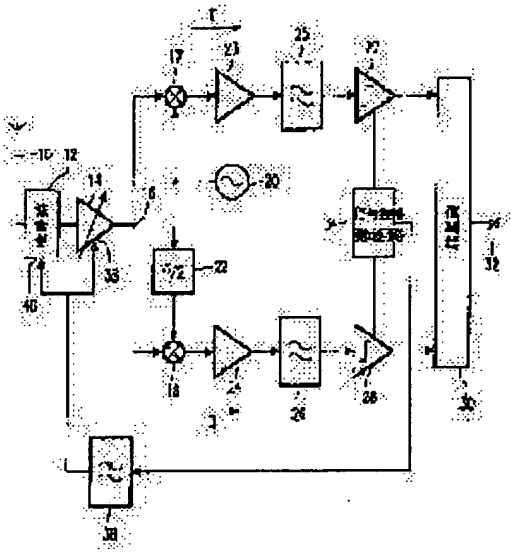
Priority number : 96 96301740 Priority date : 14.03.1996 Priority country : EP

(54) POWER-SAVING METHOD FOR RADIO RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent occurrence of a tertiary mutual modulation product and also to save power of a radio receiver by controlling the gain of a radio- frequency signal amplifier means, in response to the signal intensity that is higher than a prescribed level of sensitivity.

SOLUTION: The output of a radio-frequency amplifier 14 is divided by a signal dividing node 16, and some of input signals are supplied to the signal paths I and Q, which are orthogonal to each other. A signal amplitude measurement circuit 34, connected to the limiting amplifiers 27 and 28, produces an output signal to show the amplitude of the received signal. The output of the circuit 34 supplies according to the requests the gain control signals to the control input 38 of the amplifier 14 and the control input 40 of a PIN diode attenuator 12 via an LPF 36.



h c g e e f h

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

h c g e e f h

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] How to save the power of the wireless receiver by which the gain of a radio frequency stage is controlled when only a predetermined amount exceeds the value of the sensibility which gives a bit error rate with signal strength.
[Claim 2] How to save the power of the wireless receiver which consists of the phase of judging a figure-of-merit value to a predetermined bit error rate, a phase of setting up a larger predetermined sensibility value than the above-mentioned figure-of-merit value, and a phase that supplies gain control to the input stage of a wireless receiver according to the signal strength exceeding the above-mentioned predetermined sensibility value.
[Claim 3] The above-mentioned predetermined sensibility value is an approach according to claim 2 characterized by being set as the large value to 20dB more substantially than the above-mentioned figure-of-merit value.
[Claim 4] The above-mentioned predetermined sensibility value is an approach according to claim 2 characterized by setting only 15dB as a large value more substantially than the above-mentioned figure-of-merit value.
[Claim 5] The wireless receiver which becomes from a means detect an input radio-frequency signal, the radio-frequency signal magnification means which were connected to the above-mentioned detection means, a means judge the reinforcement of the above-mentioned input radio-frequency signal, a means set up the threshold signal-strength value to which only a predetermined amount exceeds the figure-of-merit value over a predetermined bit error rate, and a means control the gain of the above-mentioned radio-frequency magnification means according to the signal strength exceeding the above-mentioned threshold by which a judgment was carried out [above-mentioned].
[Claim 6] The above-mentioned threshold signal strength value is a receiver according to claim 5 characterized by being set as the large value to 20dB more substantially than the above-mentioned figure-of-merit value.
[Claim 7] The above-mentioned threshold signal strength value is a receiver according to claim 5 characterized by being set as 15dB upper part more substantially than the above-mentioned figure-of-merit value.
[Claim 8] The receiver according to claim 5 characterized by connecting the amplitude-limiting means to the signal input of the above-mentioned radio frequency signal magnification means.
[Claim 9] It is the receiver according to claim 5 which an adjustable signal attenuating means is connected to the input of the above-mentioned radio frequency magnification means, and is characterized by judging extent of attenuation of the above-mentioned adjustable signal attenuating means by the above-mentioned gain control means.
[Claim 10] The above-mentioned adjustable signal attenuating means is a receiver according to claim 9 characterized by being constituted by the pin diode.

---

h c g cg b eb cg e e h c

[Translation done.]

h c g cg b eb cg e e h c

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the amelioration about the receive section of the wireless transceiver contained in the vocabulary "a wireless receiver" in order to simplify explanation of a wireless receiver or this application specification. this invention -- especially -- a wireless newspaper and digital one -- it is turned to power saving relevant to cordless carrying/mobile equipment like a movable device to which electric power is supplied by cel form telephone and the list with a dc-battery.
[0002]
[Description of the Prior Art] In a wireless receiver, the important description of the architecture which affects power consumption is the radio frequency section. The wireless receiver is movable, and since the distance from the antenna for transmission changes, the field strength of a desired signal continues broadly and changes. An SN ratio changes with change of field strength. In the case of a digital signal transmission system, the sensibility made an inquiry is replaced by desired radio frequency input power in order to attain predetermined BER (bit error rate) of 0.01.
[0003] Generally, a wireless receiver contains an automatic-gain-control (AGC) system in order to avoid nonlinearity on condition that the Taishin number resulting from the large signal which is not desired. An AGC system usually measures the amplitude of all signals, and the result is used in order to prevent applying the overload which may generate the 3rd larger intermodulation product than the signal of the lost request to a mixer, and to reduce the gain of radio frequency amplifier under the conditions of high interest profit.
[0004]
[Problem(s) to be Solved by the Invention] However, since sensibility's being higher than the demand at the time of receiving a digital signal, speaking generally, it is not optimal from a viewpoint of power saving to use an AGC system in the above-mentioned mode. The purpose of this invention is improving power saving of a wireless receiver while preventing generating of the 3rd intermodulation product.
[0005]
[Means for Solving the Problem] According to the whole surface of this invention, the approach of power saving of a wireless receiver is offered. The gain of a radio frequency stage is controlled when only a predetermined amount exceeds the value of the sensibility which gives a bit error rate with signal strength. The method of saving the power in the wireless receiver offered by the 1st field of this invention consists of the phase of judging a figure-of-merit value to a predetermined bit error rate, a phase of setting up a larger predetermined sensibility value than the above-mentioned figure-of-merit value, and a phase that supplies gain control to the input of the above-mentioned wireless receiver according to the signal strength exceeding the above-mentioned predetermined sensibility value.
[0006] The wireless receiver offered by other fields of this invention becomes from a means detect an input radio-frequency signal, the radio-frequency signal magnification means which were connected to the above-mentioned detection means, a means judge the reinforcement of the above-mentioned input radio-frequency signal, a means set up the threshold signal strength to which only a predetermined

amount exceeds a figure-of-merit value, and a means control the gain of the above-mentioned radio-frequency signal magnification means according to the signal strength exceeding the above-mentioned threshold by which a judgment was carried out [above-mentioned].

[0007]

[Embodiment of the Invention] If this invention has level high 15dB to 20dB, for example more substantially than the sensibility as which the input digital signal was specified, it is based on the bit error rate which reaches the demand of the specified perfect system being realized. If it puts in another way and has level with the signal of all requests higher than 15dB of upper parts of sensibility where the above was specified, since the output signal of radio frequency amplifier will be higher than the specified minimum value, a current is consumed by magnification of the starting large input signal. However, when the amplitude of an input signal is smaller, radio frequency amplifier gives desired higher magnification.

[0008]

[Example] Hereafter, this invention is explained, without being limited to the example with reference to an accompanying drawing. In a drawing, the same reference number is used in order to show the corresponding description. The zero intermediate frequency receiver shown in drawing 1 consists of an antenna 10 connected to the radio frequency amplifier 14 which can adjust gain through the pin diode attenuator 12. The output of radio frequency amplifier 14 is separated by the signal division node 16, and a part of input signal is supplied to the signal pass I and Q of the relation which intersected perpendicularly. If it says to a detail more, a signal part will be supplied to the 1st input of mixers 17 and 18. It connects with the 2nd input of a mixer 17, and about 90 degrees of local oscillators 20 which have the frequency which is substantially equivalent to the carrier frequency on the concept of the signal of the request received with the antenna 10 are connected to the 2nd input of a mixer 18 using the phase shifter 22. The output of the mixers 17 and 18 with which the phase intersected perpendicularly is supplied to the amplifier 23 and 24 of each mixer latter part. Low pass filters 25 and 26 choose a difference signal from the result of mixing in each output of amplifier 23 and 24. Limiting amplifier 27 and 28 has the input connected to the output of low pass filters 25 and 26, and the output connected to the demodulator 30 which has an output 32, respectively.

[0009] The signal amplitude measurement circuit 34 is connected to limiting amplifier 27 and 28. A circuit 34 generates the output signal showing the amplitude of the received signal. The output of a circuit 34 is connected to the low-pass loop filter 36 which supplies a gain control signal to the control input 38 of radio frequency amplifier 14, and the control input 40 of the pin diode attenuator 12 according to a demand. Drawing 2 is the graph of the request signal strength WSS plotted to the bit error rate BER, and it turns out that it disappears while request signal strength increases a bit error rate. It is specified more highly 15dB than the sensibility defined in order that the sensibility PS which the bit error rate BER of a receiver is specified according to this invention, for example, corresponds by count of **** might be judged, next the safety allowance M of receiver sensibility might give the specified bit error rate BER, it is prepared in order to maintain the allowances whose gain control of radio frequency amplifier 14 and/or the pin diode attenuator 12 is these 15dB, and the gain of amplifier 14 is lowered preferably. As a result which attains this gain control, current consumption of the radio frequency stage of a receiver is reduced maintaining a bit error rate BER to a certain within the limits, and 3rd intermodulation distortion is prevented.

[0010] Drawing 3 is a graph which shows the request signal strength WSS to the gain control electrical potential difference AGC. In respect of predetermined [of an abscissa], the receiver sensibility to the specified bit error rate BER is called PS. After a gain control electrical potential difference increases, the 15dB allowances M appear, in order to reduce the gain of radio frequency amplifier 14, and/or in order to make the attenuation supplied by the pin diode attenuator 12 increase.

[0011] Drawing 4 is the current consumption Is. It turns out that receive and the plotted request signal strength WSS is shown, and current consumption decreases toward the minimum value in Point M while a gain control electrical potential difference increases. Drawing 5 is the simplified flow chart explaining the approach by this invention. In step 42, the signal strength to the predetermined bit error rate BER is

specified. Presetting of the value of signal strength is carried out in step 44, predetermined the value of the higher one, for example, 15dB upper part. In step 46, the transmitted signal is received and signal strength, for example, RSSI, is measured. In step 48, it is inspected whether the measured signal strength RSSI exceeds the value which is 15dB. If the result of inspection is negation (N), processing will return to step 46. On the contrary, if the result of inspection is affirmation (Y), attenuation of the gain of radio frequency amplifier 14 and/or a pin diode attenuator will be adjusted at step 50. Processing of the above-mentioned flow chart returns to step 46 until processing is ended, as shown in step 52.
[0012] Although the zero intermediate frequency amplifier was explained with reference to drawing 1 , he needs to understand that this invention is applied also to a superheterodyne receiver. By reading the indication of this invention, other deformation becomes clear at this contractor. This deformation is well-known in the field of the design of a wireless receiver and its component part, manufacture, and use, and in addition to the description, it is already used instead of being the description indicated by the indication of above-mentioned this invention. Although the publication of the claim of this application is format-ized by the specific combination of the description The range of the indication of this application [whether it is related to the same invention indicated by the current claim, and] He needs to understand that whether the same technical technical problem as this invention is solved in a list includes independently the combination of the new description indicated clearly or suggestively or the new description, or those general forms. An applicant for this patent needs to notice a new claim about that it may formulize about the combination of the above-mentioned description and/or the above-mentioned description during the connection of the further application derived from this application or this application.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the amelioration about the receive section of the wireless transceiver contained in the vocabulary "a wireless receiver" in order to simplify explanation of a wireless receiver or this application specification. this invention -- especially -- a wireless newspaper and digital one -- it is turned to power saving relevant to cordless carrying/mobile equipment like a movable device to which electric power is supplied by cel form telephone and the list with a dc-battery.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In a wireless receiver, the important description of the architecture which affects power consumption is the radio frequency section. The wireless receiver is movable, and since the distance from the antenna for transmission changes, the field strength of a desired signal continues broadly and changes. An SN ratio changes with change of field strength. In the case of a digital signal transmission system, the sensibility made an inquiry is replaced by desired radio frequency input power in order to attain predetermined BER (bit error rate) of 0.01.
[0003] Generally, a wireless receiver contains an automatic-gain-control (AGC) system in order to avoid nonlinearity on condition that the Taishin number resulting from the large signal which is not desired. An AGC system usually measures the amplitude of all signals, and the result is used in order to prevent applying the overload which may generate the 3rd larger intermodulation product than the signal of the lost request to a mixer, and to reduce the gain of radio frequency amplifier under the conditions of high interest profit.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since sensibility's being higher than the demand at the time of receiving a digital signal, speaking generally, it is not optimal from a viewpoint of power saving to use an AGC system in the above-mentioned mode. The purpose of this invention is improving power saving of a wireless receiver while preventing generating of the 3rd intermodulation product.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] According to the whole surface of this invention, the approach of power saving of a wireless receiver is offered. The gain of a radio frequency stage is controlled when only a predetermined amount exceeds the value of the sensibility which gives a bit error rate with signal strength. The method of saving the power in the wireless receiver offered by the 1st field of this invention consists of the phase of judging a figure-of-merit value to a predetermined bit error rate, a phase of setting up a larger predetermined sensibility value than the above-mentioned figure-of-merit value, and a phase that supplies gain control to the input of the above-mentioned wireless receiver according to the signal strength exceeding the above-mentioned predetermined sensibility value.
[0006] The wireless receiver offered by other fields of this invention becomes from a means detect an input radio-frequency signal, the radio-frequency signal magnification means which were connected to the above-mentioned detection means, a means judge the reinforcement of the above-mentioned input radio-frequency signal, a means set up the threshold signal strength to which only a predetermined amount exceeds a figure-of-merit value, and a means control the gain of the above-mentioned radio-frequency signal magnification means according to the signal strength exceeding the above-mentioned threshold by which a judgment was carried out [above-mentioned].
[0007]
[Embodiment of the Invention] If this invention has level high 15dB to 20dB, for example more substantially than the sensibility as which the input digital signal was specified, it is based on the bit error rate which reaches the demand of the specified perfect system being realized. If it puts in another way and has level with the signal of all requests higher than 15dB of upper parts of sensibility where the above was specified, since the output signal of radio frequency amplifier will be higher than the specified minimum value, a current is consumed by magnification of the starting large input signal. However, when the amplitude of an input signal is smaller, radio frequency amplifier gives desired higher magnification.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings] .
[Drawing 1] It is the block schematic diagram of a zero intermediate frequency receiver.
[Drawing 2] It is drawing showing the curve of WSS (request signal strength) opposite BER (bit error rate).
[Drawing 3] It is drawing showing the curve of a request signal strength pair AGC (automatic gain control) electrical potential difference.
[Drawing 4] It is drawing showing the curve of request signal strength pair current consumption.
[Drawing 5] It is the flow chart of automatic-gain-control processing.
[Description of Notations]
10 Antenna
12 Pin Diode Attenuator
14 Radio Frequency Amplifier
16 Signal Division Node
17 18 Mixer
20 Local Oscillator
22 Phase Shifter
23 24 Amplifier
25 26 Low pass filter
27 28 Limiting amplifier
30 Demodulator
32 Output
34 Signal Amplitude Measurement Circuit
36 Low-pass Loop Filter
38 40 Control input

[Translation done.]

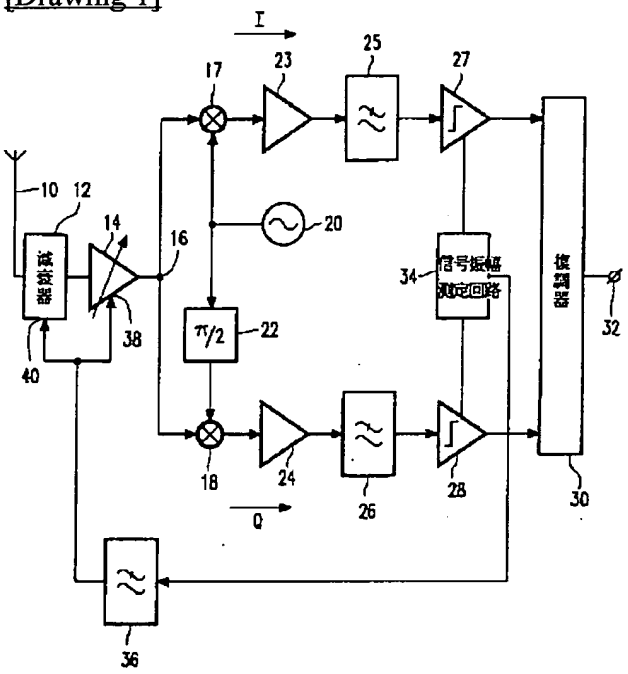
* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

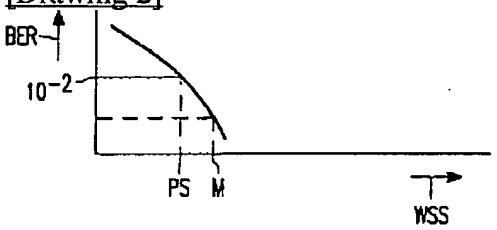
[Drawing 1]



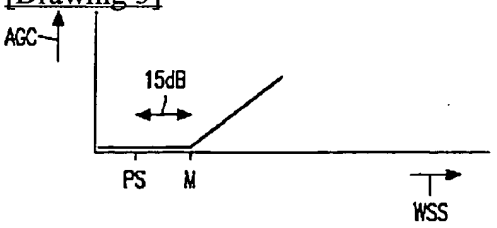
34 : Signal measurement circuit

36 : LPF

[Drawing 2]

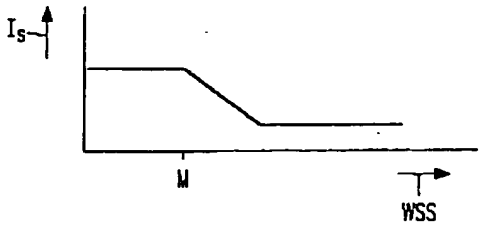


[Drawing 3]

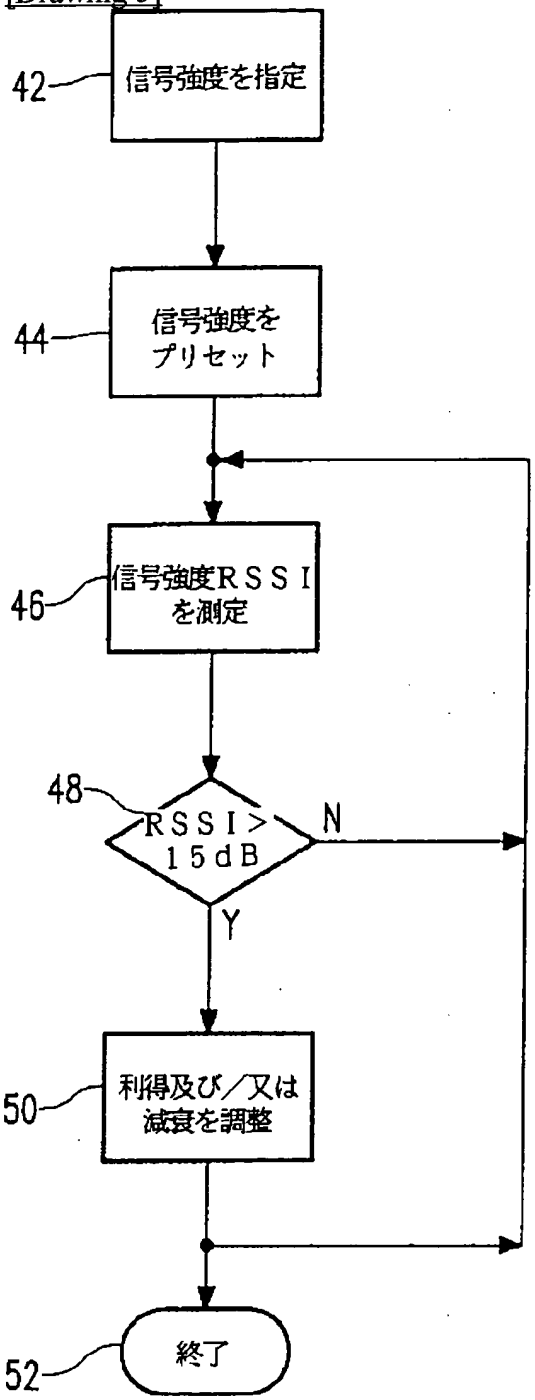


[Drawing 4]

h c g cg b eb cg e e



[Drawing 5]



[Translation done.]

h c g cg b eb cg e e